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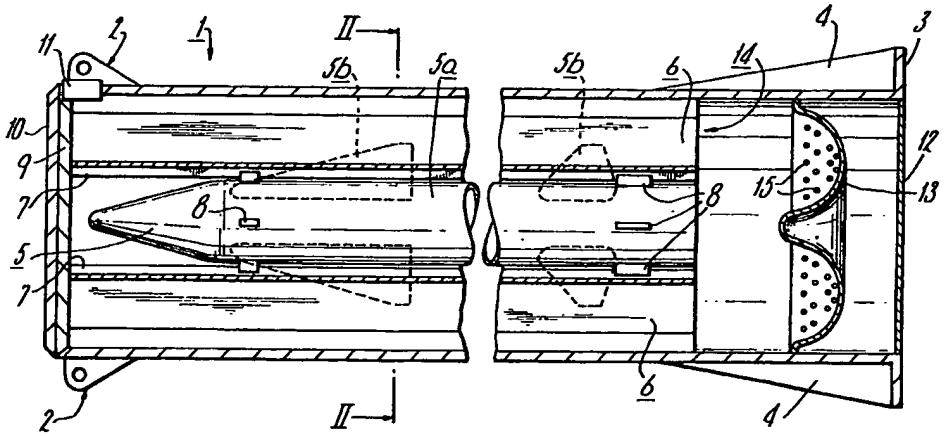
(54) Missile launcher

(57) A container serving as both a storage enclosure and launch tube for a missile comprises an efflux deflector 13 positioned for receiving the missile efflux and deflecting it around and into a series of ducts 14 which run alongside the missile 5 to the missile exit end of the container 1, which end has an openable cover 9, 10 operable to close both the missile exit and the exits from the ducts. The efflux deflector 13 which preferably defines an annular trough shape may comprise perforations leading to a chamber within the container and behind the deflector, the chamber serving to absorb some of the transient pressure peaks which may develop at the missile side of the deflector.

Fig.1.



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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

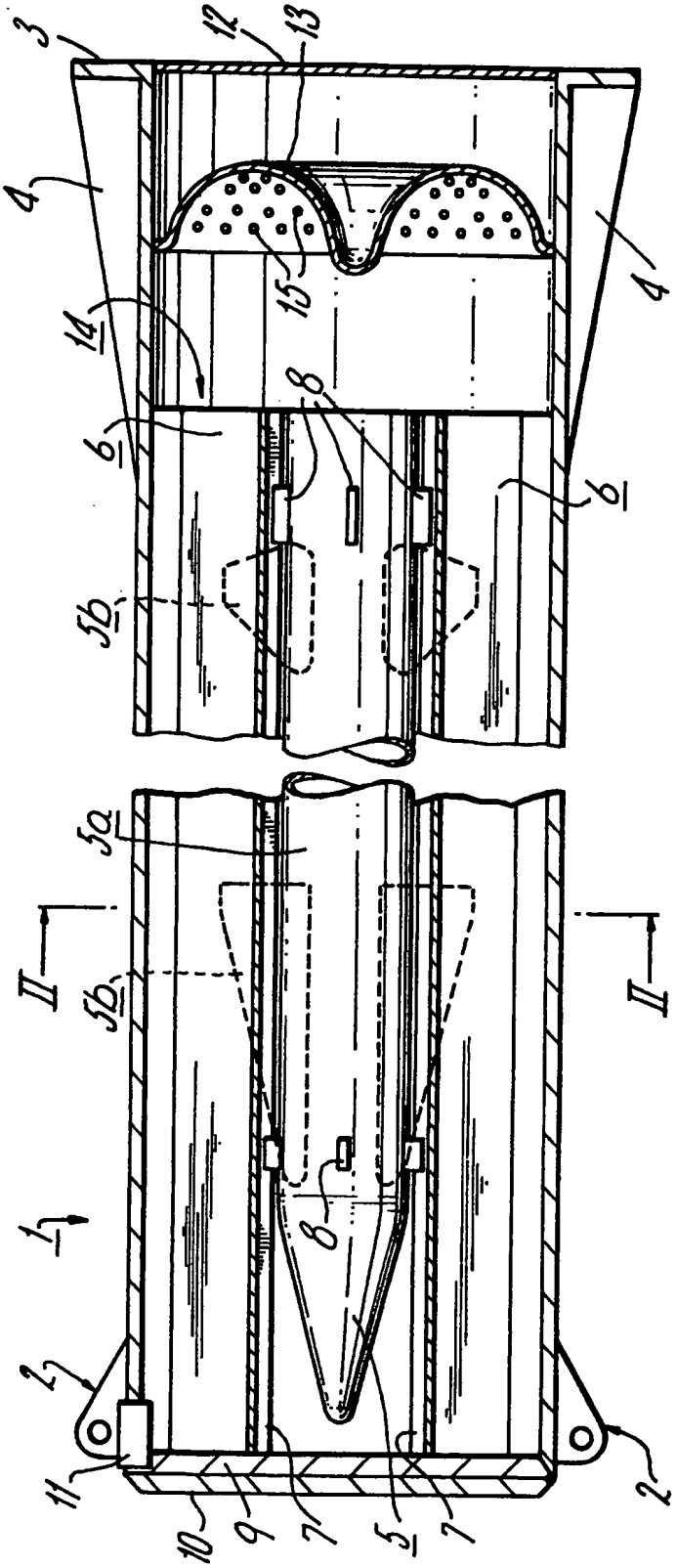


Fig.1.

Fig.2.

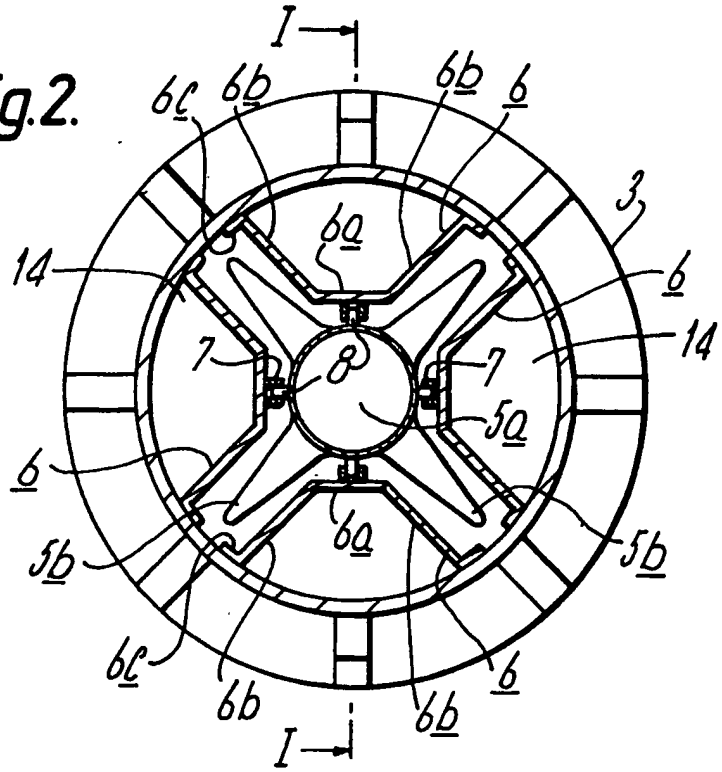


Fig.3.

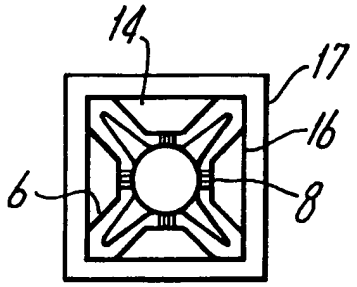
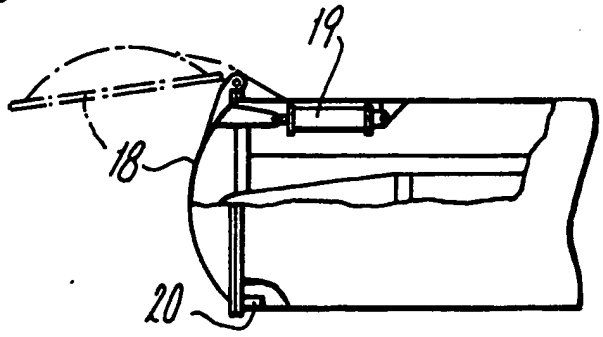


Fig.4.



SPECIFICATION

Launching missiles

The invention relates to a "containerised" missile systems in which one or more missiles are supplied in and launched from a respective container or box, the container being adapted both for storage of the missile and to act as a barrel for firing. Such systems give a degree of versatility in that a land vehicle, ground station or ship say can be relatively easily adapted to carry one or a battery of the containers. Generally, the containers are mounted to launch the missiles vertically but this is not essential. Also, for compactness, it may be desirable to store the containers horizontally, *e.g.* in a stack on or below a ship's deck.

A number of design difficulties associated with such systems concern the management of the efflux from the missile when it is fired. It is known for the mounting arrangment for a battery of containers to include a common plenum chamber and exit stack(s) with which the containers are able to communicate. This makes for additional complexity of the mounting arrangement and possibly also the containers, since each must be provided with an openable door or the like to prevent interference with one missile by the efflux of another which has been fired.

According to one aspect of the present invention, there is provided a container for housing a missile and for having the missile fired therefrom, the container incorporting an integral efflux management system including duct means, deflector means for directing the missile efflux into the duct means, and closure means for maintaining the container normally closed while ensuring, on firing of the missile, that the duct means becomes open to allow exit of said efflux.

By way of example, the container can comprise an elongate box along the interior surface of which run ducts leading from an efflux deflector positioned behind the missile to the exit end of the container, which exit end is closed by a cover openable to allow exit of the missile from the container and the efflux from said ducts.

According to a second aspect of the invention, there is provided a container for having a missile fired therefrom, the container having missile efflux deflector means positioned inside it for receiving the efflux from the missile when it is fired and for deflecting said efflux into an entry aperture of at least one duct, which duct is an integral part of said container.

According to a third aspect of the invention, there is provided a container for having a missile fired therefrom, the container being elongate and being openable at one end to allow exit of missile from within the container and the container comprising at least on missil efflux directing duct xt nding alongsid a missile receiving space within the contain r betw en an fflux exit at l ast near said one end of the container and a duct entry interm diate said on and th other end f the contain r, and efflux deflect r means positioned inside th container for receiving the efflux from a missil stored in said missile receiving space and for deflecting said efflux into said duct entry.

Said fflux deflector means may be spaced from said other end of the container to define a chamber betwe n which and a space at the efflux r ceiving side of th defl ctor means a limited degree f pressure communication is possible, for example *via* perforations in said deflector means, said chamber thereby becoming operable to reduce the magnitude of transient pressure peaks at said efflux receiving side of the deflector means.

For a better understanding of the invention, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 is a sectional elevation of a launch container with a missile inside it,

Figure 2 is a section on the line II II in Figure 1,

Figure 3 is a cross-sectional view of a modified launch container, and

Figure 4 is a partly sectioned elevation of part of a second modified launch container.

The container 1 shown in Figure 1 is generally cylindrical and has lifting lugs 2 fitted at one end thereof and an annular mounting flange 3 at the other end, triangular strengthening webs 4 extending from the flange 3 to a short way along the container. Within the container is a missile 5. The container may be made of plastics material, metal or any other suitable material or it may comprise a combination of such materials. The container wall may be such as to provide a degree of armour protection to its contents or it may be only partly armoured, say on one side thereof which, in use, faces most likelihood of damage. The lifting lugs 2 may be arranged to give the subsidiary function of preventing the container from rolling about when laid on the deck of a ship say, perhaps in a stack along with many other such containers. The flange 3 serves to enable the container to be mounted in its position from which firing of the missile may take place. This position could be with the container and missile axes vertical, the flange bolted down to some suitably designed part of a ship's deck say, or it could be with the axes horizontal or inclined in which case of course some suitable vertical or inclined fixing member is provided for flange 3. The fixed mounting for the container might also comprise some form of cradle and such a cradle might allow for variation of the container axis direction.

Attached to the inner wall surface of the container are four elongate channel members 6 having a truncated-vee cross section, *i.e.* having a base portion 6*a*, two side walls 6*b* extending from respective edges of the base portion and the distance between them becoming greater with distance from the base portion and two outwardly turned flanges 6*c* extending from the free edges of the wall-portions. The channel members 6 are fixed to the container wall *via* the flanges 6*c*, which flanges may be slightly curved for a good fit, and are spaced ar und the container axis s that each base porti n 6*a* faces the base portion 6*a* f an pposite chann l member and is spaced therefrom. Thus, th contain- r axis facing surfaces f th channel m mb rs and the container internal surface porti ns respectively

xt nding between each two adjacent channel members t g ther bound a space which, in cross-section, consists f a square superimposed on a cruciform shape, th arms of the cross taking in the corners f the square. Thus, the space is adapted to receive the missil 5 with th missile body 5*a* lying between th channel member base portions 6*a* and its fins 5*b* extending from the body to between the facing side walls of respective channel member pairs. The dimensions of the channel members and such are adapted so that within reason, the free space around the missile is minimised in cross-sectional area with a view to correspondingly minimising back-flow of missile exhaust gases past the missile. Attached to the container axis facing surface of each channel member base portion 6*a* are two spaced rails 7 which define between them a guide groove. Outwardly extending equispaced guide lugs or feet 8 are provided on the missile, four near the front and four further back, to slidably engage in the guide grooves, which hence guide the missile from the container on firing.

The missile nose is near that end of the container which has the lifting lugs 2, this end being sealed by an inner frangible cover 9 and, covering the cover 9, an outer rough-handling cover 10. The cover 10 is intended to be removed manually say when the container has been set-up in its position of use and/or at times when it is likely to be needed. The inner frangible cover is burst or blown off just prior to missile firing by say a pyrotechnic rupture device 11 (shown only diagrammatically). However, both covers are designed to allow for the possibility of inadvertent firing of the missile while it is held within the container. Being frangible, the cover 9 would be burst by the resultant gas pressure while the cover 10 could be so held in place that it also is ejected by the gas pressure.

The back or tail of the missile 5 lies at a position spaced from the other end of the container, which end is closed by a wall 12, and the channel members 6 also end at or about this position. The space between this position and the wall 12 is partitioned by an efflux deflector 13.

The deflector is made of sheet material shaped to define a surface of revolution, particularly the surface formed by rotating a semi-circle with its straight side perpendicular to the container axis around that axis, *i.e.* to form a half of a toroid. Thus, at its centre, the deflector has a round nose or projection which extends towards the missile and, surrounding this projection, a circular channel of semi-circular cross-section which tends to deflect the missile efflux through 180° and back in the direction from which it arrived into the ducts 14 defined between the container wall and the surfaces of the channel members 6 which face away from the missile. These ducts lead the efflux out of the container at the front *i.e.* in the same direction as the missile emerges. A c ating of ablative (not shown) material may be applied to all or selected parts of the exposed surfaces of th ducts 14 and/or the deflectors 13.

As will be realised, the deflector 13 has to be strong nough to withstand the normal firing forces but at th same time be designed to attenuate any shock waves which may be set up and which might otherwis affect the firing. To impr ve absorption of sh ck waves, the deflect r has perforations 15 therein so allowing any shock wave p aks t be absorbed int th space b hind the deflector, this space thus f rming a kind of plenum chamber.

The shape of the container 1 could be modified, for example as shown in Figure 3 where both the container 16 and the mounting flange 17 are square in cross-section. Other parts in Figure 3 are similar to corresponding parts in Figures 1 and 2 and bear the same reference numerals.

As shown in Figure 4, the covers 9 and 10 of Figure 1 could be replaced by a hinged dome-shaped door 17 coupled to a pneumatic, hydraulic, spring-operated or pyrotechnic opening device 18 and held closed by a releasable catch 19.

At the exit end of the container, the ducts 14 could be shaped, or special deflector members could be provided, to deflect the missile efflux outwardly away from the container axis and hence away from the missile flight path.

The container may be designed for single-shot operation or made more durable so that, possible with some refurbishment, it can be used a number of times.

Instead of being smoothly rounded as shown, the deflector 13 could comprise a series of flats making up, at least roughly, the shape shown.

Various known safety devices may be incorporated in the container, for example a water deluge mechanism.

CLAIMS

1. A container for housing a missile and for having the missile fired therefrom, the container incorporating an integral efflux management system including duct means, deflector means for directing the missile efflux into the duct means, and closure means for maintaining the container normally closed while ensuring, on firing of the missile, that the duct means becomes open to allow exit of said efflux.

2. A container according to claim 1, in the form of an elongate box along the interior surface of which run ducts leading from an efflux deflector positioned behind the missile to the exit end of the container, which exit end is closed by a cover openable to allow exit of the missile from the container and the efflux from said ducts.

3. A container for having a missile fired therefrom, the container having missile efflux deflector means positioned inside it for receiving the efflux from the missile when it is fired and for deflecting said efflux into an entry aperture of at least one duct, which duct is an integral part of said container.

4. A container for having a missile fired therefrom, the container being elongate and being p n-able at one end to allow exit of missile from within the c ntainer and th container comprising at least ne missile efflux directing duct xtending al ngside a missil rec iving space within the container between an efflux exit at least near said one nd of th container and a duct ntry interm diate said n and

the other end of the container, and efflux deflector means positioned inside the container for receiving the efflux from a missile stored in said missile receiving space and for deflecting said efflux into said duct entry.

5. A container according to claim 4, wherein said efflux deflector means is spaced from said other end of the container to define a chamber between which and a space at the efflux receiving side of the deflector means a limited degree of pressure communication is possible, for example *via* perforations in said deflector means, said chamber thereby becoming operable to reduce the magnitude of transient pressure peaks at said efflux receiving side of the deflector means.

6. A container substantially as hereinbefore described with reference to the accompanying drawings.

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